INTERSPECIFIC BEHAVIOUR OF THE GREAT INDIAN BUSTARD *ARDEOTIS NIGRICEPS* (VIGORS)[1]

Asad R. Rahmani and Ranjit Manakadan[2]

(*With seven plates*)

The Great Indian Bustard *Ardeotis nigriceps* (Vigors) lives in grassland, open scrub land and semi-deserts of the Indian subcontinent (Ali & Ripley 1983) along with a large number of species such as the blackbuck *Antilope cervicapra*, fox *Vulpes bengalensis*, white-eyed buzzard-eagle *Butastur teesa*, Indian roller *Coracias benghalensis*, black drongo *Dicrurus adsimilis*, etc. In its interaction with other species, the bustard shows fear of some, is antagonistic to others, and is neutral in attitude to a few. The species which are either feared/avoided/partially tolerated are termed here as 'non-associate species' while the animals which sometimes move with the bustard are termed as 'associate species'. Non-associate species are fox, vultures, eagles, crows and livestock while the associate species like drongo, roller, white-eyed buzzard-eagle, etc. are tolerated when they come very near to the bustard and even perch on it (as in the case of the drongo). This paper deals with the interspecific behaviour of the great Indian bustard with the animals found in its habitat. This study is a part of the investigation of the ecology, behaviour and present distribution of the great Indian bustard under the Endangered Species Project of the BNHS.

Study Areas: The main study areas were Nanaj in Solapur district, Maharashtra (17°41′N and 75°56′E, alt. 486 m) and Karera in Shivpuri district, Madhya Pradesh (25°30′N and 78°5′E, alt. 271 m). The Nanaj Study area consists of about five sq km of grassland, woodlot, grazing land and crop fields, while Karera consists of about 50 sq km of open scrub dominated by 50-60 cm tall *Zizyphus rotundifolia* bushes. This area forms a part of the 202 sq km Karera Bustard Sanctuary. The study period extended from September 1981 to June 1985.

[1] Accepted December 1985.

[2] Bombay Natural History Society, Hornbill House, Shaheed Bhagat Singh Road, Bombay 400 023.

Observations

A. Birds

a. Non-associate species

1. *Vultures*

The Scavenger Vulture *Neophron percnopterus* appears to be the bird most feared by the bustard, especially the nesting hen. On many occasions we had seen female bustards frightened by scavenger vultures. For example, on 13 June 1982 at Karera, a scavenger vulture flew over the nest of a female bustard. Within seconds, the hen lowered her neck and sunk to the ground. After five minutes she slowly raised her neck, looked all around and then relaxed. Another encounter recorded was of a female bustard foraging alone on 19 June 1982 at Karera. A scavenger vulture landed nearby and the bustard hid among *Zizyphus rotundifolia* bushes as long as the vulture was in the vicinity. A large eagle.

probably Tawny *Aquila rapax*, was also seen at that time in the area.

Other species of vultures are not so feared. On 7 June 1982 at Karera in the evening we were watching an adult cock bustard and a hen. The hen was foraging near her nest. At 1750 hrs two King vultures *Sarcogyps calvus* landed in the area to drink. At once the hen became alert and started walking towards the nest. Soon a Whitebacked Vulture *Gyps bengalensis* joined the king vultures. The hen stood near the nest and then settled down on the egg but soon got up and again stood near the nest, watching every movement of the vultures which were 100-150 m away. The hen later flew off towards the river to drink though the vultures were in the vicinity. After 23 minutes she came flying back and landed 600-650 m from the nest and as usual started drifting towards the nest while foraging. The whitebacked vulture flew over her head but no aggressive behaviour was seen. The hen settled on the egg and five minutes later both king vultures flew off, watched by the hen as long as they were visible. The cock bustard which was also in the area kept on displaying and remained unconcerned by the presence of vultures.

Though our observations are limited, it appears that the bustards are afraid of *Neophron* probably due to the vulture's well-known egg breaking habit (Alcock 1972). Bustards are not very frightened of the king and the whitebacked vultures as there is no potential danger from them to the egg or to the chick. McCann (1939) had seen scavenger vulture trying to break an egg of a flamingo (*Phoenicopterus ruber antiquorum*) in the Rann of Kutch. Recently Auffenberg (1981) saw an Egyptian (Scavenger) vulture using a stone to break the shell of a live turtle (*Lissemys punctata*). Apparently there seems to be more chances of predation of a bustard egg by scavenger vultures.

2. *Eagles and Falcons*

On a few occasions we have seen bustards being frightened by eagles. On 14 July 1982, for instance, at 1800 hrs a large eagle, probably Tawny settled on the ground in an area where two female bustards were foraging. Both hens reacted, one flew away for a short distance while the other stood alert with neck feathers erected in threat behaviour. We suspect that of the two bustards, one was a post-juvenile female following its mother and this young bird was more frightened. Soon both hens walked away from the eagle which looked exhausted and was being mobbed by a great grey shrike (*Lanius excubitor*) and a redwattled lapwing (*Vanellus indicus*).

On another occasion two subadult male bustards were slowly drifting towards three females when an eagle came flying from a nearby jheel and flew above the bustards. All the five birds flew off in different directions. The females landed together and the males landed nearer to each other. The eagle was probably an immature greater spotted (*Aquila clanga*).

Another interesting eagle-bustard interaction was seen in April 1984 in Karera. Appearance of an eagle scattered all the bustards from our study area. Though up to nine bustards were seen frequently in that area in April-May, as long as the eagle was present, only the territorial cock remained. One hen was on the nest when the eagle appeared for two days. On 1 May in the morning, we saw her sitting crouched on the nest throughout our three hours of observation. She did not leave for the usual foraging activity when the eagle was around. Dharmakumarsinhji (1962) has noted 'freezing' of an incubating hen bustard when an occasional eagle flew overhead.

We have observed an adult cock bustard boldly but unsuccessfully threatening an eagle *Aquila* sp. near a termitarium. On 2 August 1983, a subadult male bustard was seen eating white ants (alates) as they emerged from a damp hole in the morning. Bank (*Acridotheres ginginianus*), and common (*A. tristis*) mynas, Indian roller (*Coracias benghalensis*), crows (*Corvus splendens* and *C. macrorhynchos*) and drongo (*Dicrurus adsimilis*) were present around the bustard. The bustard was seen snapping the winged termites as they flew out from the hole. The tail of the bustard was cocked up in a fan shape, perhaps to threaten other birds. An adult cock then came over and chased the younger male away and started picking the alates. It also fanned its tail but only for a short time. The subadult male kept lingering around and soon the alates stopped emerging from that hole. Both the bustards walked away amicably and were joined by another subadult male. The adult male saw emergence of winged termites from a new hole and quickly went over and started picking the insects but kept the two subadult males away. Shortly thereafter an eagle landed and all the smaller birds scattered but the cock bustard moved only a few feet. The eagle started eating the alates and while the subadult males moved away the adult male vainly tried to threaten the eagle which ignored the demonstration. The cock then walked away and all three males flew and settled about 100 m where they soon found a new hole from which the alates were emerging.

A similar encounter near an active termitary was reported by Howells & Fynn (1979) between a Denham's Bustard (*Otis denhami*) and about forty Black and Yellow kites (*Milvus migrans migrans* and *M. m. parasiticus*), one Steppe Eagle (*Aquila nipalensis*), three Lesser Spotted Eagles (*A. pomarina*) and two Wahlberg's eagles (*A. wahlbergi*). The Denham's bustard was seen defending the ephemeral food source. When a kite landed at the termitary, the bustard ran towards it 'with wings raised', tail partially erect and neck craned forward ..... the kite was struck twice before escaping".

Though we do not have any direct evidence of an eagle killing a great Indian bustard, our observations suggest that the bustards, especially hens, consider eagles as a potential threat. Fraser (1982) found a Martial Eagle (*Polemactus bellicosis*) on a freshly killed adult Kori Bustard (*Ardeotis kori*). Some ten metres from the kill, another Kori Bustard was seen hiding in tall grass...." probably too frightened to move" (Fraser 1982).

Though falcons (mainly lanner *Falco biarmicus*) is occasionally seen at Karera and at Nanaj, we have not seen any encounter with the bustard. We think, there is no danger to an adult great Indian bustard from a falcon. Even trained falcons are seldom able to kill a great Indian bustard. Elliot (1880) wrote that falconers sometimes try to kill bustards with Peregrine (*Falco peregrinus peregrinator*) but they are no match for the bustard. "So rarely has the pursuit been successful that the Nawab of Banganapiliny (*sic*) in Cuddapah confered a village Inam (or free tenure) on a falconer who achieved the feat" (Elliot 1880).

3. *Owls*

Due to the temporal differences in the activity periods of the owls and the bustard, very few encounters were seen. The great horned owl (*Bubo bubo*) and the shorteared owl (*Asio flammeus*) are seen at Nanaj and we have observed one bustard-owl encounter with each species. On 14 August 1982 at 0550 hrs, a cock bustard was seen displaying (threat display?) near a rubble wall on which *Bubo bubo* was sitting. Both the birds were calling. Soon the bustard stopped displaying and

moved away. The owl flew and settled nearer to the bustard. The male again cocked the tail and started calling. In the dim light visibility was poor. The owl flew to its roost when the light increased.

The great horned owl is a formidable predator (Grossman & Hunlet 1965). Even remains of a peafowl have been found in its stomach contents (Ali & Ripley 1983). Though we have no direct evidence of a great horned owl killing an adult or young great Indian bustard, it is perhaps capable of doing this. Winterbottom (1962) has described that Townsend found a fresh-plucked Korhaan (*Eupodotis afroides*) ready for eating, in an old raptor nest from which he had shot a *Bubo lacteus.*

One interspecific encounter was seen between the bustard and the shorteared owl. In October 1983 at Nanaj at dusk before settling for roosting two young chicks of about 6-8 weeks old and three hens were frolicking. The chicks were jumping and exercising their wings. Suddenly a shorteared owl appeared and it followed the chicks who flew effortlessly and made a circle of nearly 200 m. The hens just looked at the owl and made no attempt to threaten it probably knowing that the owl can not harm the chicks who were slightly bigger than the owl. The owl also made no attempt to catch the chicks which slowly returned to their respective mothers. The bustards did not change the roosting site due to the appearance of the owl.

4. *Harriers*

Pale (*Circus macrourus*), Montagu's (*C. pygargus*) and Marsh (*C. aeruginosus*) harriers are quite common in winter at Karera and at Nanaj. At Karera, the harriers arrive in September when most of the bustard chicks have fledged so there is practically no danger to them from the harriers. At Nanaj, the harriers are present September onwards when the bustard chicks are still very small. Even then there appears to be no danger from the harriers due to the effective protection provided by the hen bustard to the chick. The bustards either ignore the harriers or at the most threaten them by partially cocking the tail. The harriers also generally avoid the bustards. On a few occasions we saw a juvenile bustard threatening a harrier which came near to it while its mother just ignored the raptor.

5. *Yellow-wattled Lapwing*

At Karera on the morning of 1st May 1984 a solitary female bustard was mobbed by two yellow-wattled lapwings (*Vanellus malabaricus*) when it came near their nest. The bustard was apparently unperturbed and it walked away at its usual pace. The lapwings were aiming at the head of the bustard. A complete egg of a quail (*Coturnix*) was recorded from the stomach of a great Indian bustard (Ali & Ripley 1969) so there are chances that it can also pick up eggs of a lapwing.

6. *Cranes*

Three or four pairs of Sarus cranes (*Grus antigone*) are resident in our study area at Karera. Sarus and bustards both feed in harvested wheat fields though not necessarily at the same time. However, in 1984-85 when we started baiting bustards with wheat near our hide, a pair of sarus was also 'hooked' to the bait and every morning they were seen eating the bait with the bustards. Similarly in a bengal gram (*Cicer arietinum*) field, both the species were seen together (Plate 1 A-B) and bustards were seen moving freely between the sarus without any agonistic behaviour. The male bustard appears to be more tolerant of sarus than a female.

Between September and December 1984,

about 400 Demoiselle Cranes (*Anthropoides virgo*) were seen at Karera. They used to fly noisily in flocks all over the area but very few encounters with bustards were seen. Once they flew over seven female bustards which just looked up and resumed foraging. In another instance, nearly 100 cranes landed in a groundnut field (*Arachis hypogea*) where ten bustards were foraging. After landing the cranes started feeding vigorously while the bustards appeared to be visibly uncomfortable and they kept looking at the cranes. Slowly all the bustards drifted away leaving the cranes in the field.

7. *Barheaded Goose*

During winter, more than 500 Barheaded Geese (*Anser indicus*) are found in our study area in a jheel at Karera. These geese greatly damage the bengal gram crop. The bustards are also very fond of this crop. Occasionally we have seen both the species feeding in the same field but the bustards were never seen walking in the middle of a flock of geese. By the end of winter in 1984, only one gram field was left unharvested which was grazed by the geese, sarus and bustards. Once we saw the three species feeding at the same time but not very close to each other. Generally, the geese and the bustards fed at different times in the same field mainly because the appearance of geese attracted the attention of the field owner while the bustards were tolerated by him. Therefore, few geese bustard encounters were noted.

8. *Crows*

Crows (*Corvus splendens* and *C. macrorhynchos*) are feared by incubating hen bustards and generally avoided by non-breeding females. According to Dharmakumarsinhji (1962) crows appear to be a constant menace to the egg. We suspect that one of the eggs in 1983 at Karera was destroyed by a crow. In the subsequent year we actually saw egg predation by a crow. On 11 April 1984 when a hen bustard had gone to drink water from a river. at 0725 hrs, a jungle crow saw the hard-set egg and pecked at it. When the hen returned she atonce started chasing the crow but the damage had already been done. For more than an hour, the crow was in the vicinity of the nest and was actively threatened by the hen. As soon as the crow landed, the bustard used to rush at it, beak widely open, wings drooping and sometimes, tail cocked. She was very agile in following the persistent crow. Many times the bustard jumped up to peck at the crow with the beak open as widely as possible. This went on for 8-10 minutes, then the crow flew away but returned at 0900 hrs, for a short while. In the evening, the hen bustard was roaming in the nest area and when she saw the crow on the nest, she came flying and aggressively threatened the crow. Thrice she jumped over the crow but could not catch the wily predator. However, she was successful in chasing the crow away. Next day the crow was not seen in the area though the bustard was seen in the vicinity of the destroyed egg. A crow can destroy a bustard egg only in the absence of a hen bustard because on many occasions we have seen a hen successfully chasing away a crow from the nest.

9. *Rock Bush Quail*

On 18 June 1985, we saw an adult bustard vigorously displaying to three rock bush quail *Perdicula argoondah*. The bustard was intentionally moving towards the foraging quails which soon disappeared in the bushes. This display lasted for about two minutes. When the quails disappeared the cock returned to its favourite spot in the arena and continued displaying.

b. ASSOCIATE SPECIES

Black drongo (*Dicrurus adsimilis*), white-eyed buzzard-eagle (*Butastur teesa*), redheaded merlin (*Falco chicquera*) and Indian roller (*Coracias benghalensis*) are the four birds often seen with the bustard. These four species greatly benefit by their association with the bustard as they eat the insects flushed by the bustard. This association falls under the classical case of commensalism. Commensalism is defined by Clarke (1954) as an "association (of different species) in such a way that only one of the organisms is benefited but neither is harmed". Feeding association occurs when a bird (or mammal) intentionally approaches another organism and thereby gains foraging advantage (Dean and MacDonald 1981).

1. *Drongo*

Between our two field stations, we have commonly seen drongo (*Dicrurus adsimilis*) associated with bustard in Nanaj but rarely in Karera. When we started our work in September 1981 in Nanaj, drongos were seen moving with the bustards. An additional development since 1982 is that the drongo has learnt to ride on the back of the bustard. This seems to be a recently acquired behaviour due to the change in the habitat. In 1981 most of the drongo-bustard associations were observed in a semi-woodlot plantation where there were many perches in the form of small saplings for the drongo to perch on. From 1982, the bustards were sighted more often in a pure grassland area where there were very few perches. In the absence of perches, the drongo started sitting on the back of the bustard.

The drongo at Solapur shows local movement. It is practically absent from the grassland in summer and early monsoon though some are seen near the villages and towns. We have kept a record of the first sighting of the drongo and first sighting of a drongo riding on a bustard:

Year	First sighting of a drongo in the study area	First sighting of a drongo riding on a bustard
1982	28 September	28 October
1983	5 October	24 October
1984	4 October	25 October

In 1982, the first drongo was seen in Nanaj study area on 28 September in a grassland plot with stunted Neem *Azadirachta indica* bushes of not more than 70-90 cm in height. Slowly their number increased. Exactly a month later on 28 October, a drongo was seen riding on a bustard. Soon this habit was acquired by most of the drongos. Due to lack of rains, movements of bustards in our study area was erratic (Rahmani & Manakadan 1986), but whenever bustards were seen they were followed by one or two or even more drongos. The drongo used to follow the bustards throughout their foraging period, sometimes even waiting near a resting bustard. For instance, one day a drongo sat on a bush near the resting adult cock bustard for 25 minutes before flying away. As soon as the cock became active again in the afternoon, a drongo was seen following it. Even if a bustard flew and landed in a new area, the drongos followed. Sometimes up to five drongos were seen with a single bustard.

A female bustard is more tolerant of a drongo sitting on her back than a male. Even a hen with a month old chick ignores a drongo following it. On 23 November 1983, we saw two hens together each with a chick and each with a drongo sitting on its back. Similarly a sub-adult male also allowed a drongo to sit on it. However, the adult cock bustard evidently finds it irritating to have a drongo sits on its

back. We have rarely seen a drongo sitting on the adult male bustard for more than a few seconds, while on females they sit up to five minutes at a stretch. As soon as a drongo alighted on a cock's back, it turns and shoos it off. Once in November 1984, three drongos were following an adult cock when one settled near the tail, the male gave a startled jump and on landing threatened the drongos by opening its wings, cocking the tail and erecting neck feathers, but the drongos continued to pester the bustard.

The sitting spot of a drongo on the back of a bustard also differs in the male and the female. On the adult cock, they generally sit (momentarily) on the rump but on a female or a subadult cock, they sit on the mantle or the back. This was markedly noticed in 1984 than in earlier years. Apparently this is an adaptation of the drongo to keep itself away from the beak of a pugnacious adult cock who generally looks back and tries irresolutely to peck at the drongo.

After settling in the grasslands of Nanaj for a few weeks, the drongos become so used to following the bustards that on 31 October 1984, when a dummy of a female bustard was put out to decoy a male, a drongo came and sat near the dummy for 15 minutes !

At Karera the drongo is a resident species but it is very rarely seen following bustards. Moreover, whenever we saw a bustard being followed by a drongo, the association was always for a few minutes and after a long interval. Sometimes this association was not seen for weeks or for months. Only once for a whole week a drongo was seen following a bustard every now and then. Unlike Nanaj, this association is not a long term one here. At Nanaj the drongos were such persistent companions of bustards that it became easy for us to locate a bustard just by searching for the drongos. All drongos were not necessarily near bustards, but all bustards had a drongo or two in attendance. Such type of persistent association was never noticed at Karera. Secondly at Karera we never saw drongos sitting on bustards probably because at Karera, the ubiquitous *Zizyphus rotundifolia* bushes provide a convenient perch so a drongo has no reason to sit on a moving bustard. At Nanaj also, most sightings of a drongo sitting on a bustard were in the grassland plot where there were hardly any bushes for perching. In the semi-woodlot plots or where a perch was available, the drongo preferred to use it while attending a bustard.

The first drongo-bustard association at Karera was seen on 2 June 1982, five days after we started intensive studies. A hen bustard was followed by two drongos and an Indian roller at 1755 hrs. The roller displaced the drongos and after about ten minutes both the drongos flew away.

The second such association was noticed after a year on 21 July 1983 when the drongo was seen following a female bustard for five minutes. After that no such association was seen for a couple of months though the bustards were watched daily. In 1984 on 8 June a drongo was seen following a hen with a chick for 40 minutes. The hen was not disturbed and she never threatened the drongo even when it came near the young chick. On another occasion we saw similar behaviour probably with another mother and chick.

Drongo-bustard association is purely commensal with the former as a beneficiary since the drongo(s) catches the insects flushed by the foraging bustard. Thus the drongo uses the bustard as a beater'. Occasionally the drongo(s) may actually compete with the bustard for the insects but generally it takes only those that are fast fliers and thus beyond bustard's capacity to catch.

It is difficult to explain the very casual

drongo-bustard association at Karera though both the species are resident and are seen in the same open-scrub area throughout the year, while at Nanaj, both the species have a local movement and they are seen in the grasslands mainly during the monsoon. If a drongo is equally benefited at both the places (i.e. Karera and Nanaj) by following a bustard, logically a more persistent association should be seen at Karera rather than at Nanaj because a resident population should learn and *retain* its experience of following a bustard if the experience is beneficial to it.

The answer possibly lies in the difference of habitat/vegetation between Karera and Nanaj. At Nanaj, there is a sudden increase in the population of insects after the rains and as the grass becomes almost uniformly tall, most of the insects in it lie hidden unless they are flushed out by some moving object. As there are very few perches in grassland from where a drongo can sally to catch flying insects, it is advantageous for this adaptable species to utilize a big bird like a bustard as a mobile perch which at the same time flushes numerous winged insects. On the other hand, at Karera the *Zizyphus* bushes and the occasional *Acacia leucophloea* trees provide innumerable perches for a drongo. Unrestricted livestock grazing also does not allow the grass to grow uniformly tall and leaves many open patches where detecting insect prey is easy. Moreover, the insect population (chiefly grasshoppers) reaches its peak in summer and early monsoon when spotting an insect from a convenient perch is apparently easier than from the back of a bustard whose movement to a particular area is unpredictable.

In Africa the feeding associations of the Carmine Bee-eater (*Merops nubicoides*) with the Kori Bustard have been documented (North 1944, Jackson 1945, Lynn-Allen 1951). Interestingly, the northern race of the Carmine Bee-eater has developed the habit of sitting on the backs of mammals and bird species (North 1944) while in the southern race this habit is not seen. Ali & Ripley (1983) have recognised two subspecies of the Black Drongo within the Indian limits: *Dicrurus adsimilis albirictus* in north India and *D. a. macrocercus* in the peninsula below the Tropic of Cancer. Like the Carmine Bee-eater, the drongo also shows some behavioural differences in its two subspecies, i.e. *macrocercus* has developed the habit of perching on a moving bustard while *albirictus* does not show this habit though it perches on other animals like cows, sheep and goats. However, we think this is more due to adaptation to the local conditions rather than any inherited subspecific behavioural difference.

2. *White-eyed Buzzard-Eagle*

The White-eyed buzzard-eagle *Butastur teesa* is another associate of the bustard. In Karera it is commonly seen in the monsoon months but with the arrival of winter it moves to other areas. Like a drongo or a roller, the buzzard also follows a foraging bustard but only at a distance.

Buzzard-bustard association is more persistently seen at Nanaj than at Karera. The buzzards are so much benefited by the flushing of grasshoppers by the bustards that sometimes as many as four buzzards were seen together in attendance. For instance on 18 August 1982 at 0845 hrs. four buzzards were seen following a cock bustard at Nanaj. The same day at 1000 hrs. three buzzards foraged with the bustard. When the bustard sat down among a tussock of grass for resting, a buzzard came and sat near it for eight minutes, waiting for the bustard to get up and flush insects for it.

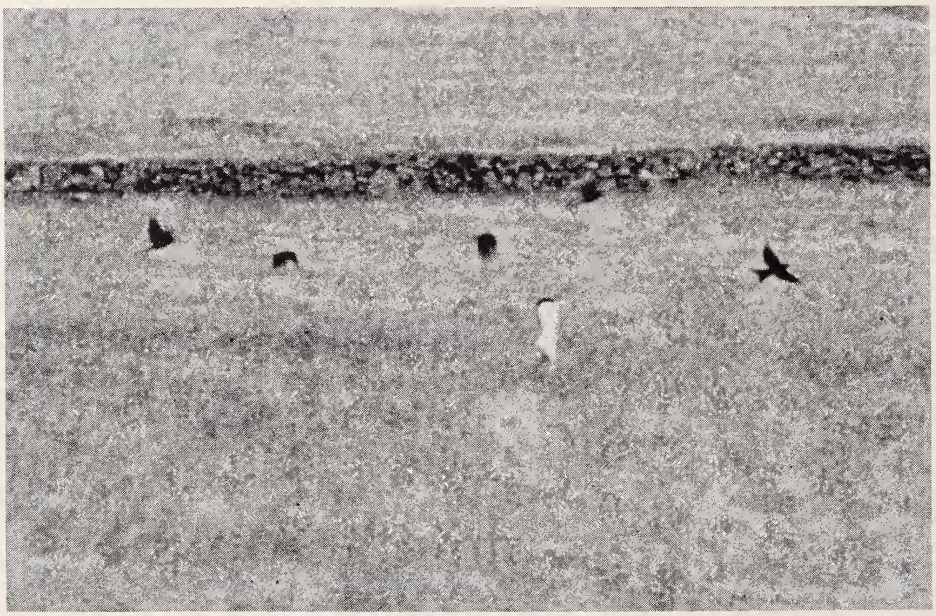
In 1983 and 1984 very few buzzard-bustard associations were seen at Nanaj. Moreover,

A. A male great Indian bustard with a sarus crane in a chana field.

B. A subadult male bustard moving inbetween a pair of sarus cranes in a chana field.

Photos: Asad R. Rahmani

A. Black drongos are often found in association with the bustards at Nanaj.



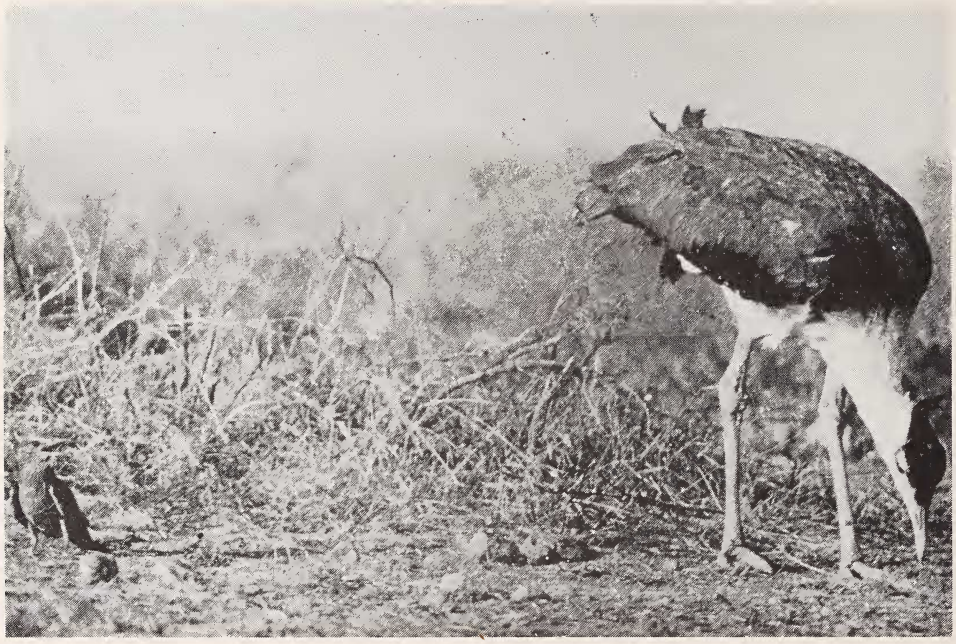
B. Five drongos following a male bustard.

Photos: Asad R. Rahmani

A. An Indian roller following a great Indian bustard.

B. An Indian roller sitting very close to foraging bustards.

Photos: Asad R. Rahmani



A. An Indian roller expectedly waiting near a bustard for an insect to be flushed.

B. An Indian roller waiting on a bush close to a foraging bustard.

Photos: Asad R. Rahmani

A. A pair of common myna following two female bustards.

B. The same pair of myna near another female bustard.

Photos: Asad R. Rahmani

A. A young female bustard walking away from a blackbuck.

B. Three female bustards alerted by a herd of goats.

Photos: Asad R. Rahmani

A. An adult cock bustard being disturbed by cows.

B. A hen with a post-juvenile male chick moving away from a herd of goats and a goatherd.

Photos: Asad R. Rahmani